

The LHC Signatures of the Extended Gauge Structures in Supersymmetry

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The extensions of the minimal supersymmetric model (MSSM), driving mainly from the need to solve the μ problem, involve novel matter species and gauge groups. These extended MSSM models can be searched for at the LHC via the effects of the gauge and Higgs bosons or their fermionic partners. Traditionally, the focus has been on the study of the extra forces induced by the new gauge and Higgs bosons present in such models. An alternative way of studying such effects is through the superpartners of matter species and the gauge forces. In this talk, we thus consider a $U(1)'$ gauge extension of the MSSM, and perform a detailed study of the signatures of the model through the production and decays of the scalar quarks and gluino, which are expected to be produced copiously at the LHC. After a thorough study of the distinctive features of such models with regard to the signatures at the LHC, we carry out a detailed Monte Carlo analysis of the signals from the process $pp \rightarrow n$ leptons + m jets + EMT, and compare the resulting distributions with those predicted by the MSSM. Our results show that the searches for the extra gauge interactions in the supersymmetric framework can proceed not only through the forces mediated by the gauge and Higgs bosons but also through the superpartner forces mediated by the gauge and Higgs fermions. Analysis of the events induced by the squark/gluino decays presented here is complementary to the direct Z' searches at the LHC.

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